

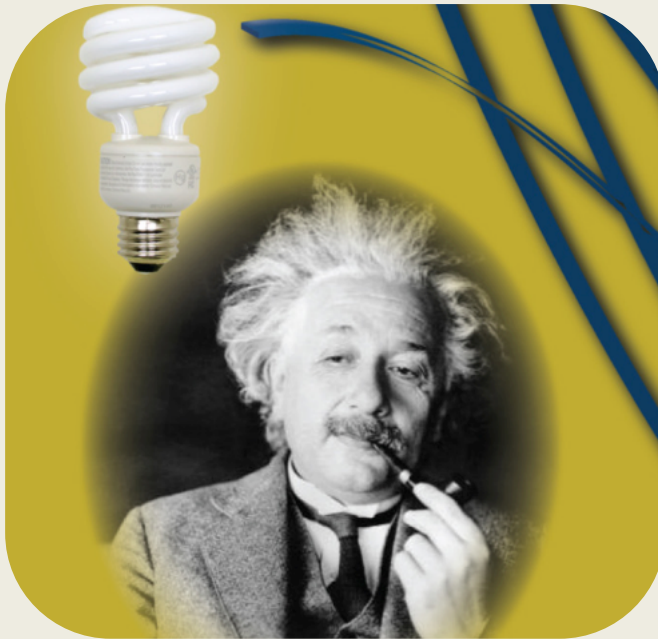
Goddard Applied Sciences Seminar on Proposal Writing

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Science Proposal Support Office (SPSO), Code 605
https://science.gsfc.nasa.gov/605/index_internal.html

October 30th, 2017

How do I create a persuasive proposal?



Match your plans to the *needs* in the Call

What's your motivation? –
Your Key Message is the solution

Graphics + Text for high impact

The structure of a ROSES proposal

Importance of planning and reviewing

Match your plans to the needs in the Call

Seek to answer the following questions

How can you respond to their needs with research you want to pursue?

How will your approach to solving their problem yield a high return on investment?

What discriminates you from your competition?

How will your work impact the field?



So what?

Why our team?



What's your motivation? – Your Key Message is the solution

Start with a motivation paragraph that expresses a critical need that you are uniquely suited to meet.

It should be drawn from needs expressed in the Call.

Don't let details distract you. Keep it short, stay on topic.

This sets the context for the whole proposal.

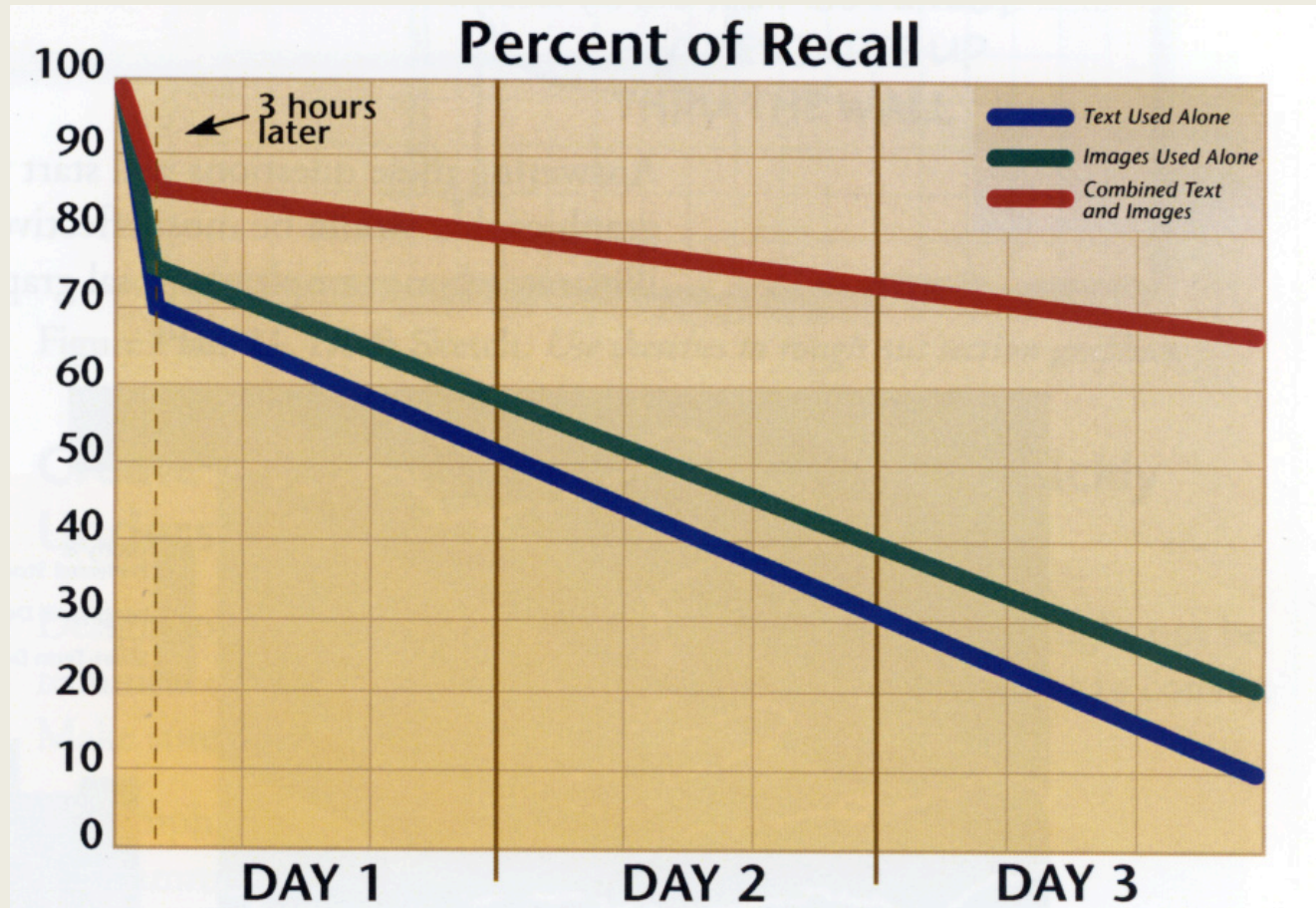
What's your motivation?

The key message is your proposed solution to their critical need expressed in the motivation

For example,

We propose X that will meet critical need Y by doing Z.

Effective graphics and text will help the reader remember your proposal



from *Writing Winning Proposals*, Shipley Associates, p. Plan-45.
and based on work by Richard Mayer
(R. E. Mayer, *Multimedia Learning*, Cambridge Press, New York, 2001)

We recommend beginning your proposal with an Executive Summary

An effective Executive Summary communicates your message in three ways

[Verbal] Motivation  Key Message

[Visual] High impact graphic and action caption

[Architecture] Overall Executive Summary

Answers “What’s this about?” “So What?” “Why me?”
plus relevance and impact.

Compelling Executive Summaries contain a strong motivation, a clear solution, and a high impact graphic and caption.

Scientific/Technical/Management

1. Executive Summary

Spectra of the icy surfaces of astronomical objects in the outer Solar System can be observed both telescopically and through fly-by and orbiter missions. Examples include recent work by the Cassini orbiter and the Hubble (HST) and Spitzer Space Telescopes, and the anticipated observations by the James Webb Space Telescope (JWST) and the New Horizons mission. The interpretation of such observational data and the determination of planetary surface properties (including the composition, temperature, and roughness) requires a substantial library of laboratory work, an area to which our research group has long contributed. In particular, the optical constants (n and k) that make up the complex refractive index ($n - ik$) of ices and mixtures at appropriate temperatures are required to model the observed surface spectroscopic features and, through these models, determine the abundances of surface species. The laboratory data are at least as important as the observed spectra in this process, which is illustrated in **Figure 1**. Given this need for quantitative spectral data one might expect a vast laboratory effort and library of ground-based measurements to support the Spitzer observatory and the anticipated needs of the JWST and similar large-scale projects, however there are large gaps in the literature and in the public accessibility of the existing data. We have the right experience and ability to meet these time-critical needs through the efforts described in this proposal.

To address these issues, we will generate optical constants of ices and ice mixtures relevant to planetary science, spanning multiple wavelength regions, compositions, and temperatures, using modern techniques to determine the density and visible refractive index values needed to make accurate calculations. All data will be made publicly available through the NASA Planetary Data System (PDS).

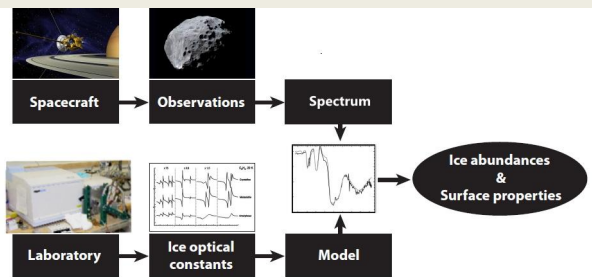


Figure 1. The process of determining planetary surface properties depends critically on laboratory measurements. The optical constants we will measure will fill gaps in temperature and composition that will allow the interpretation of spectra observed in the near-, mid-, and far-IR wavelength regions.

Motivation paragraph – expresses critical need

Key Message – your solution

High level graphic and “action caption” reinforcing message above

I. Scientific/Technical/Management

A. Executive Summary

The ratios of stable isotopes of major elements can be used to infer much about local- and global-scale processes on a planet, such as the nature of the source of organic compounds, atmospheric circulation, chemical pathways of key reactions, temperature histories, and the origins of planetary materials. Data returned from Titan by the Cassini-Huygens mission on carbon (C) and nitrogen (N) species have been used to estimate the age and history of Titan's methane (CH_4) and constrain the rates of atmospheric escape. These calculations rely on constraints of isotopic fractionation due to diffusion, escape, and chemical processes. Yet a major product of chemical processes in Titan's atmosphere – the organic aerosol that forms Titan's signature haze layer – has not been considered in models of isotopic fractionation due to lack of available data. With aerosol production occurring on the order of $10^{14} \text{ g cm}^{-2} \text{ s}^{-1}$, the aerosol serves as a significant sink for C-, H-, and N-atoms, particularly since it is ultimately removed from the atmosphere. If isotopic fractionation occurs along the chemical reaction pathways that lead to aerosol formation, these isotopes would be removed from the atmosphere and the opposite fractionation pattern would be reflected in gas-phase species. Despite the potential for aerosol formation to considerably influence the observable C- and N-isotopic ratios in Titan's atmosphere, nothing is known about the fractionation inherent in this process.

Overarching Science Question: Do the aerosols on Titan preferentially sequester C- and N-isotopes, and does this fractionation influence the ratios of $^{13}\text{C}/^{12}\text{C}$ and $^{15}\text{N}/^{14}\text{N}$ in the gas phase species of the atmosphere?

We propose to measure the **isotopic fractionation inherent in organic aerosol** formation by performing a **systematic laboratory study of the C- and N-isotope ratios** of aerosol products produced via photochemistry.

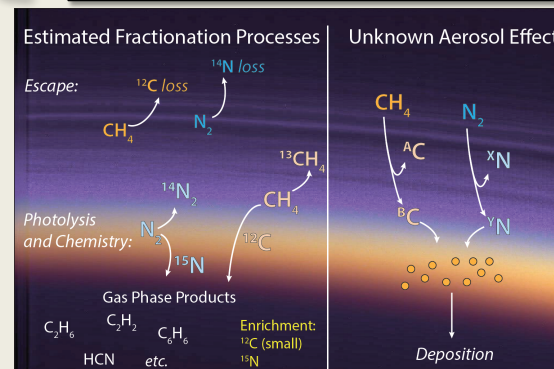



Figure 1. The isotope ratios of carbon and nitrogen species in Titan's atmosphere are affected by many processes (Mandt et al. 2009; Mandt et al. 2012; Nixon et al. 2012), but the influence of aerosol formation is completely unknown.

Structure of a generic ROSES proposal

The solicitation may ask for modifications to these sections, read the call carefully.

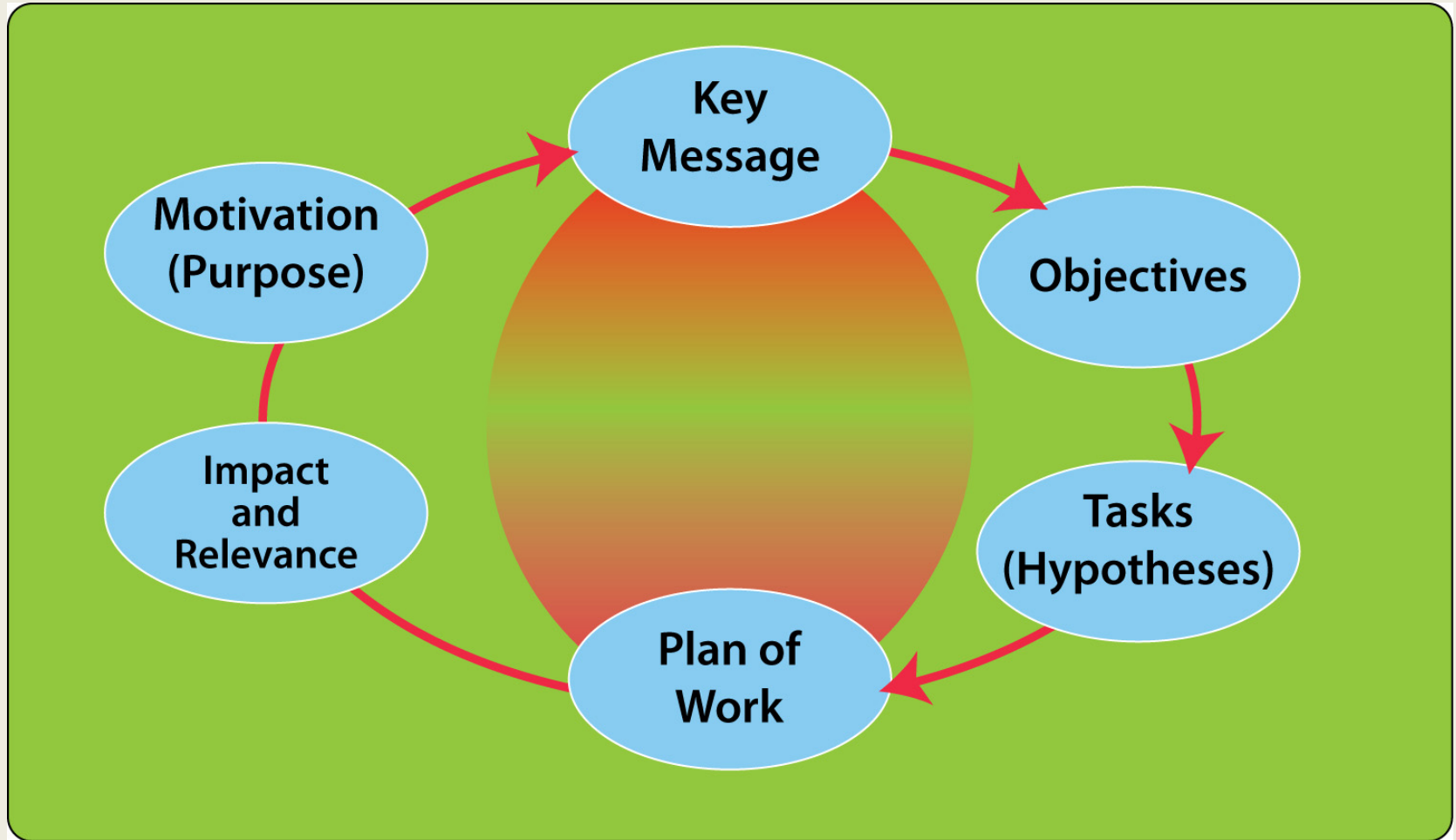
*The DMP is usually required as an NSPIRES web page entry

Table of Contents
Scientific/Technical/Management
1. Executive Summary
2. Technical Approach and Methodology
a. Section for Task 1
b. Section for Task 2
3. Impact
4. Relevance
5. Plan of Work
6. Data Management Plan*
References
Biographical Sketches
Table of Personnel and Work Effort
Current and Pending Support
Letters of Support
Budget Justification
Budget Narrative
Facilities and Equipment
Budget Details



Typically
15 pages
long

Your Message and Plan should map clearly through the major sections of your proposal



A reviewer may not necessarily begin reading your proposal on page 1!

Action Captions should *inform, interpret, and persuade*

Poor

Overview of Proposed Technology Developments.

Good

Our proposed technology developments are driven by clear science requirements and enable student participation at all levels.

Poor

An illustration of the steps for characterizing amino acids in meteorites.

Good

We have well developed and integrated preparation and analysis methods for meteoritic amino acids.

Poor

Organization Chart

Good

Our organizational structure promotes clear lines of communication and authority and includes Alaskan Natives in an advisory capacity from day 1.

Every page of your proposal should have a Take-Away message

A Key message – for overall proposal

Theme statements – for each major section

Action captions – for every figure or table

These are the items most likely to receive attention by reviewers. A page of nothing but a “wall of text” will be skipped by the skim readers.

Remember the POWER of graphics!

Continue the message in the *Plan of Work* with a focus on your team and schedule

The focus when writing Plan of Work:

Provide confidence that your team will accomplish the proposed research and fulfill customer needs within the time span proposed.

Include:

Description of expertise – why they're on your team

Description of roles and responsibilities – what they will do

A schedule – when tasks will be performed

Also consider noting the level of effort of each team member

Have you done similar work before? Draw from this experience to support your *Plan*.

Planning, preparation and reviewing is an important part of creating a winning proposal

Seek feedback at all stages of the proposal process

Strategy (Blue Team) Review

Provides early feedback; enhances strategy and teaming potential; reduces stress.

Red Team review

Combines content review, compliance focus, and key message focus;

Can boost you into “competitive range.”

Some Lessons Learned from Red Team Reviews

- Make sure reader knows your contribution to this field. Claim ownership of your work. Use active voice.
- Start paragraphs with the punch line, follow with supporting details.
- Make figures clear, avoid confusion and eye strain.
- Why should NASA fund this now?
- Maintain a clear focus; explain what you won't do.
- What are your advantages over current approaches/state-of-the-art/competitors?
- Don't forget the "Facilities and Equipment Section" in the Budget Justification. This is part of your leveraging argument *i.e.* what resources are in hand so you can "hit the ground running" when funding comes in?

Three Key Elements of a winning proposal

Responsiveness to a critical need – your proposed work constitutes an important and unique approach to meeting their needs.

Key message – your solution to fulfill their critical need

Team – your team's unique experience and capabilities provide confidence that you will fulfill their needs.

Visit the SPSO Website

- Best Practices document
- Deadlines and Points of Contact
- SPSO Budget Web Tool
- Tutorials
- Generic ROSES proposal template

https://science.gsfc.nasa.gov/605/index_internal.html

Thank You!

A Science Background section provides context, shows expertise but risks derailing the proposal

Benefits:

- provides context and illustrates the holes your work will fill
- demonstrates team expertise

Risks:

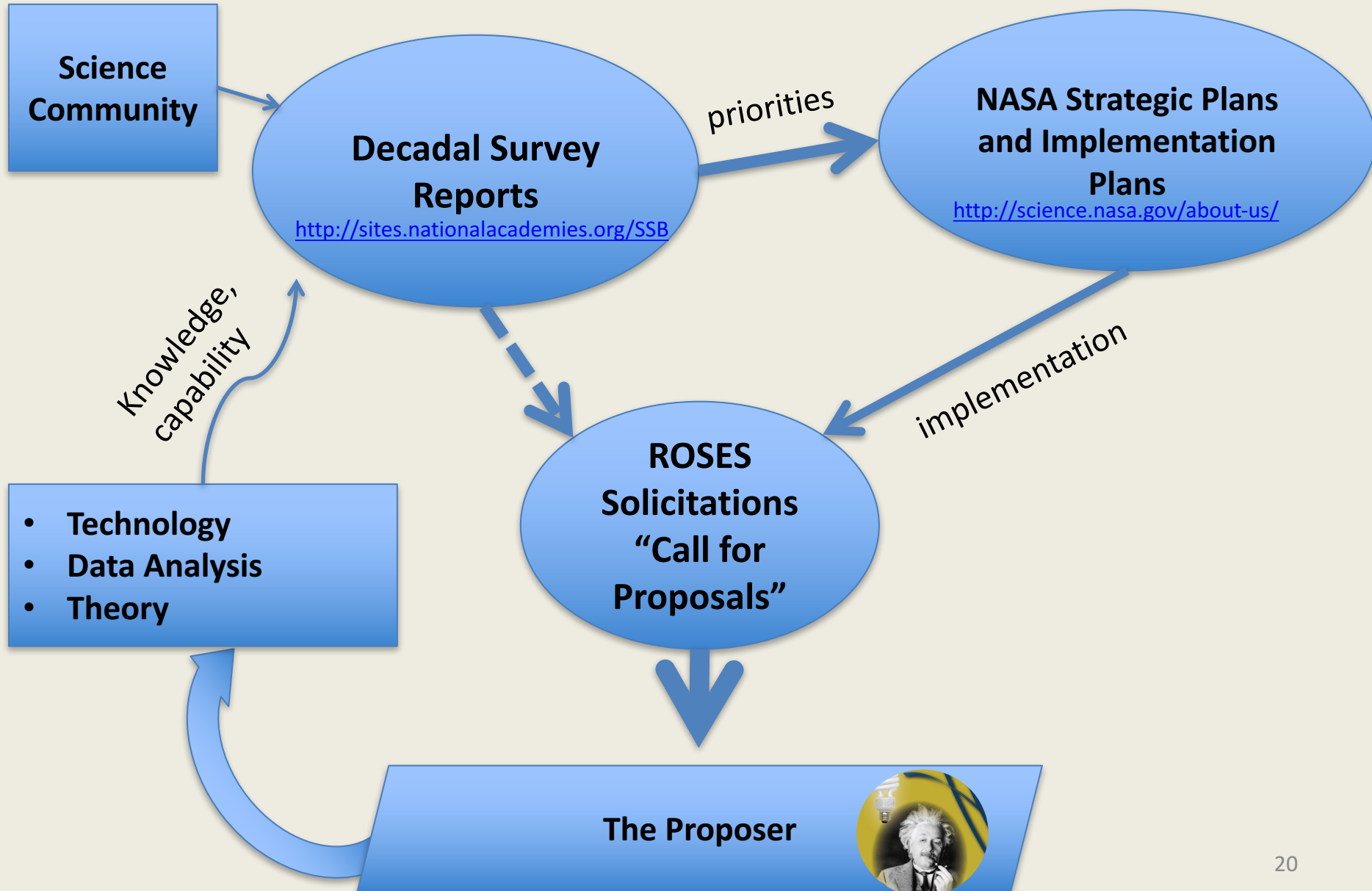
- may turn attention from your message and argument
- separates key message and research strategy

Options:

- put near beginning of Technical Approach section
or as new section after Executive Summary
- don't put it in Executive Summary

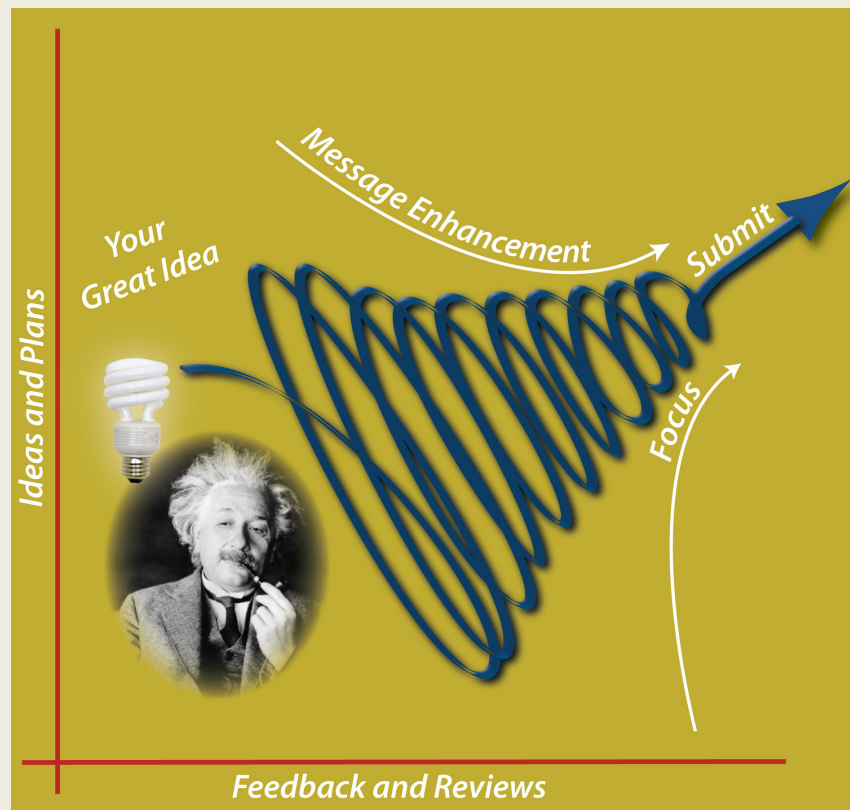
Keep the focus on answering “So What?”

NASA needs as expressed in ROSES Solicitations

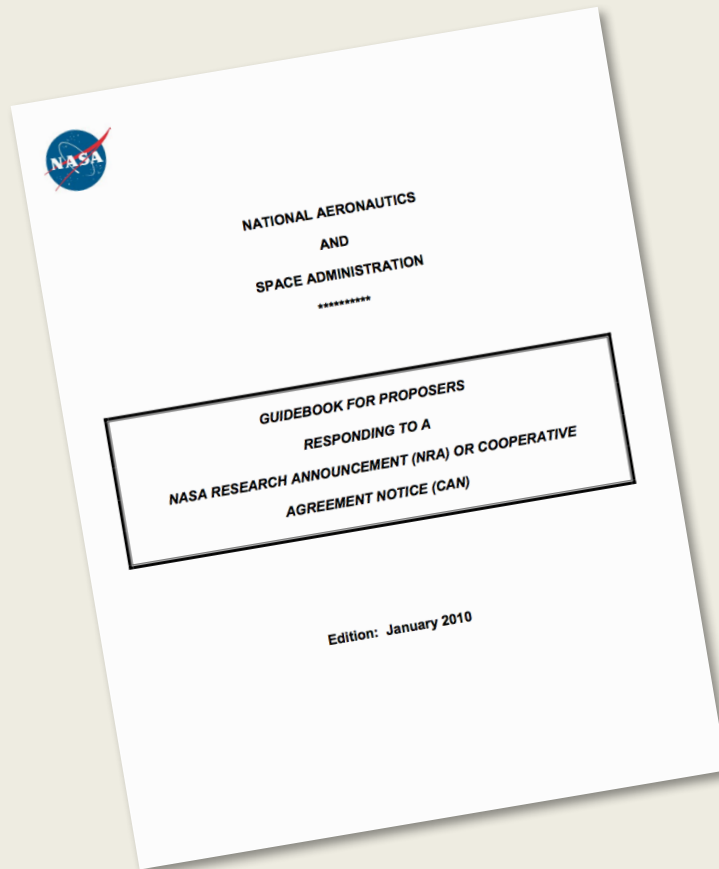


What's your motivation?

Refine and focus your message, get feedback from various sources, and read the solicitation again



The *NASA Guidebook for Proposers* and the ROSES Summary are important sources of compliance information



<http://nspires.nasaprs.com/external/>

Science Proposal Support Office Red Teams can help you refine your proposal

Provides a section-by-section review of draft;
first impressions are especially important.

Is the proposal compelling, clear, and consistent?

Is the proposal readable?

Is the proposal compliant?

Identifies strengths and weaknesses;
Provides specific suggestions for improvement.

You will receive a marked-up copy of proposal

In summary, seek to enable synergy between your overall research and your proposals

Effective proposals can provide valuable outlines and work plans for proposed work, when funded.

The proposal writing effort forces you to put into words your research goals and a clear path to accomplishing these goals. This is valuable regardless of the outcome of the proposal.